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Instrumental Approaches to Non-Intrusive Analytical Techniques for Inspection and Verification

INTRODUCTION

1. The verification provisions elaborated in CD952 would require on-site inspection of a variety of civil and military sites. Specific mention is made of the importance of instrumental and technological support to implement these provisions. The Technical Group on Instrumentation under the valuable Chairmanship of Dr Rautio of the Delegation of Finland has moved this subject forward significantly.

2. In August 1989 the UK tabled a paper (CD/CW/WP 255) describing analytical techniques appropriate to a Chemical Weapons Convention (CWC) in which, amongst other topics, reference was made briefly to the likely need for non-intrusive and non-destructive analytical techniques. Three such techniques were identified as worthy of more detailed consideration; X-ray methods, ultrasonic methods and neutron activation analysis.

3. This paper summarizes some perceptions of the feasibility of using these three methods for the on-site examination of containers, from which samples are not available, in order to gain information on the relevance of the nature of the contents in respect of the CWC.

BACKGROUND

4. Unambiguous information on the nature of compounds present at stockpiles, destruction facilities, declared production facilities, civil industrial facilities or permitted small-scale facilities can only be obtained by taking a sample of the compound for analysis by sophisticated instrumental techniques such as nuclear magnetic resonance spectroscopy, infra-red spectroscopy and mass spectrometry. These fundamental techniques may be interfaced with such sample processing techniques as gas-liquid chromatography or high performance liquid chromatography. Confirmation of the identity of the samples can be achieved by direct comparison with authenticated reference data or with an authenticated specimen of the indicated compound.

5. In some cases it may not be possible to obtain the samples required for such analysis. It may be impossible practically to acquire a sample, or too hazardous to try to take one; this might well be the case when verifying the type of fill contained in munitions in an ordnance storage site. It is therefore necessary to consider what information can be obtained by the use of non-intrusive analytical techniques and to identify such possible techniques.

6. It is not expected that non-intrusive analytical techniques will provide unambiguous identification of the contents of containers from which a sample is not available; nor is it likely that a single non-intrusive analytical technique will be entirely satisfactory. Rather a number of techniques will need to be used, each technique contributing its own particular type of information to build up an overall picture.